

WHAT IS CLAIMED IS:

1. A sealing structure for a fuel cell or an electrolyzer, having at least first and second neighboring separator plates with a sealing structure arranged between said separator plates, wherein:

said sealing structure comprises at least two layers, including at least one insulating layer and at least one sealing layer; and

the insulating layer is arranged on a carrier element.

2. A sealing structure according to claim 1, wherein the fuel cell or electrolyzer is one of a solid-oxide fuel cell and a solid-oxide electrolyzer.

3. A sealing structure according to Claim 1, wherein the insulating layer is a metal oxide.

4. A sealing structure according to Claim 1, wherein the insulating layer is made of Al_2O_3 .

5. A sealing structure according to Claim 4, wherein the Al_2O_3 is present in the structure of the γ -modification.

6. A sealing structure according to Claim 1, wherein the sealing layer comprises an inorganic material.

7. A sealing structure according to Claim 6, wherein the inorganic

material is a glass-ceramic solder.

8. A sealing structure according to Claim 1, wherein the sealing layer has additions which ensure that the sealing layer is adapted to the thermal expansion behavior of the material of a separator plate.

9. A sealing structure according to Claim 1, wherein the carrier element is a carrier layer.

10. A sealing structure according to Claim 9, wherein the carrier layer is a steel plate with an aluminum content greater than 2%.

11. A sealing structure according to Claim 9, wherein the carrier layer is a steel plate with an aluminum content greater than 4.5%.

12. A sealing structure according to Claim 9, wherein the carrier layer is constructed of a ferritic steel with a chrome content of approximately 20%.

13. A sealing structure according to Claim 9, wherein the carrier layer is constructed of a ferritic steel with a chrome content of from about 15% to about 28%.

14. A sealing structure according to claim 9, wherein the carrier layer is composed of Material Number 1.4765 or 1.4767.

15. A sealing structure according to Claim 1, wherein the carrier element is a separator plate, the insulating layer being arranged in the sealing areas.

16. A sealing structure according to Claim 1, wherein one or more carrier elements are provided with an insulating layer formed by pre-oxidation in at least one sealing area.

17. A sealing structure according to Claim 1, wherein the sealing structure is arranged in a fuel cell stack, the fuel cell stack being constructed of a plurality of individual fuel cells which are stacked above one another in a tower-type manner.

18. A sealing structure according to Claim 17, wherein the plurality of individual fuel cells have an electrolyte layer, a cathode layer and an anode layer, the anode layer being arranged on a carrying substrate layer.

19. A sealing structure according to Claim 17, wherein the insulating layer is arranged between two neighboring individual fuel cells on a top side of a separator plate, wherein the top side faces an oxidation space.

20. A sealing structure according to Claim 1, wherein the insulating layer is arranged between two neighboring separator plates of an individual fuel cell in the region of the sealing areas on at least one of the separator plates.

21. A sealing structure according to Claim 1, wherein the sealing layer is arranged on a free surface of the insulating layer.

22. A sealing structure according to Claim 1, wherein the sealing layer is constructed of an inorganic material containing additions that is adapted to the coefficients of thermal expansion of the separator plates.

23. A sealing structure according to Claim 1, wherein the insulating layer on the carrier element covers a larger surface than is required of the sealing layer.

24. A sealing structure according to Claim 1, wherein a first sealing device is arranged between the insulating layer and a neighboring separator plate, and a second sealing layer is arranged between the carrier layer and another neighboring separator plate.

25. A method of producing a sealing structure for a fuel cell or an electrolyzer, comprising:

producing at least one insulating layer on a carrier element; and
producing at least one sealing layer made of a sealing material, the sealing structure being arranged in a sealing area of a fuel cell stack.

26. A method according to claim 25, wherein the fuel cell or electrolyzer is

one of a solid-oxide fuel cell and a solid-oxide electrolyzer.

27. A method according to Claim 25, wherein the insulating layer is produced by oxidizing the carrier element in at least one area.

28. A method according to Claim 27, wherein the oxidizing takes place at a temperature above 900° C.

29. A method according to Claim 27, wherein the oxidizing takes place at a temperature above 1,050° C.

30. A method according to Claim 25, wherein after the production of the insulating layer, the sealing layer is fitted on in the form of a sealing material strand.

31. A method according to Claim 25, wherein the sealing area is arranged between separator plates, and wherein producing at least one sealing layer made of a sealing material comprises:

applying a sealing medium strand for forming a first sealing layer;
fitting the carrier layer having the insulating layer onto the first sealing layer; and

applying a sealing medium strand for forming the second sealing layer to the fitted-on carrier layer in the sealing areas.

32. A fuel cell or electrolyzer comprising a sealing structure according to Claim 1.

33. The fuel cell or electrolyzer of Claim 32, wherein the fuel cell or electrolyzer is one of a solid-oxide fuel cell and a solid-oxide electrolyzer.